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DRAFT Proposed Study:

"Massachusetts Alternate Energy Resources and Conservation Program"

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DRAFT Proposed Study:

"Massachusetts Alternate Energy Resources and Conservation Program"

Massachusetts Science and Technology Foundation

Arthur D. Little, Inc.

Massachusetts Institute of Technology Energy Laboratory

MITRE Corporation

University of Massachusetts (Amherst)

Massachusetts Alternate Energy Resources and Conservation Program

Program to study Massachusetts Alternate Energy Resources and to develop a plan, the objective of which would be to:

- reduce our dependence on imported fuels
- identify and encourage alternate energy resources and conservation programs
- bring the costs of energy to Massachusetts industry and residents to levels competitive with other areas of the nation
- attract federal attention and funding to the solution of energy problems in the region.

In support of these objectives, the Massachusetts Science and Technology Foundation proposes to co-ordinate a study to be performed by a consortium of leading academic and technological groups within the Commonwealth which would develop those alternate energy resources and conservation programs that are in the power of the state to control.

INTRODUCTION

By now, there are available the results of many studies performed both in Massachusetts and elsewhere in the nation which survey the energy inventory and have projected needs and availability for the next quarter century. These studies have added considerably to our knowledge and appreciation of the nature and complexity of the energy shortage problem.

It is indicated in several of these studies that every region has its individual problems, and, within limits, requires unique treatment.

For New England, these studies highlighted the following significant facts:

1. (1) New England has no indigenous source of fossil fuels
2. (2) New England is more dependent on imported oil than the rest of the nation
3. (3) Costs of fuel in New England are 20% higher than the average, and at least 30% higher than the lowest
4. (4) Massachusetts ranks 37th among the fifty states as a per capita consumer of energy.
5. (5) Massachusetts ranks low in terms of energy intensive industry, which consume 8% of its energy resource, compared with 29% by industry in the nation as a whole.

What these points make clear, is that

(1) New England's energy supply is highly uncertain and dependent on external events quite beyond our control.

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(2) The relative cost of fossil fuel will continue to be high for New England

The high cost of energy in New England has been identified as a factor contributing to departure by industry to other areas of the nation. This trend is ironic in light of history; our industrial beginnings were based on the abundance of cheap and clean energy.

Attempts at reducing the region's vulnerability to the uncertain availability and costs of imported fuel have been initiated. For example, capital and tax incentives have been introduced in legislative bills at both the state and national levels, encouraging the adoption of solar energy for residential heating.

The creation of ERDA and the levels of funding allotted to alternative energy sources is indicative of a national commitment to independence from foreign fuels.

However, beneficial fallout from ERDA's programs in terms of independence, price, jobs, and prosperity will not be evident in the near term.

Recommended Program

Implicit within the crisis facing the Commonwealth is an opportunity not only to reduce dependence on foreign oil, but to introduce alternative energy measures which, conceivably, could reduce our fuel costs, and thereby enhance our competitive position, and create jobs and industry.

Therefore, a timely question to be answered is "where do we stand with respect to the operational feasibility of alternative energy sources?" Will Solar energy develop an on-line capability in the near term? Will concern over nuclear hazards significantly penalize costs of nuclear energy? Can important savings in electrical energy be achieved in the use of recovered solid waste as a fuel?

We are proposing an analysis of the current status of alternative energy sources which would accomplish the following:

(1) provide answers to the questions phrased above, in terms of criteria on operational feasibility (costs/savings, safeguards, reliability).

(2) identify new state construction programs to which alternate energy sources find application. In terms of each project, determine what systems can be incorporated; initial costs and projected savings relative to conventional systems.

(3) Identify and propose techniques for stimulating economic fall-out from state-sponsored programs which incorporate alternate energy resources.

(4) Where gaps between current status and operation feas bility exist, identify techniques, measures, and incentives that might be introduced to overcome impediments to application.

(5) As a further step to expediting operational feasability, identify and propose programs that can be jointly funded by Federal and State government.

(6) Evaluate and recommend new and/or consolidated legislation to provide incentives and safeguards for alternate energy source development.

We regard the proposed program as being more than a study, but rather an action-oriented program which will have tangible results as its objective. Consequently support for this program by the state should be viewed as "seed money" rather than expenditure, since the looked-for result is a savings in the cost of operation of state-run facilities, stimulation of the economy, and a consequent increase in the inflow of tax money and a decrease in its outflow.

The proposition that new construction projects embodying the most recent fundings in energy conservation principles and incorporating alternative energy resources is a viable alternative finds confirmation in current and on-going programs: From its year long experience with solar energy the Farquier School in Warrenton, Virginia, projects capital costs of $7.50/ft. of collector under conditions of mass production and operating costs of $3.20 per million BTU. A comparable heat cost for No. 2 fuel would be $4.50 per million BTU in that program; the architect for the TriCounty Regional Vocational

School in Norfolk, Massachusetts, projects annual savings in operating costs of more than $60,000 for a combined waste heat recovery/solar energy/electric boiler system; the New England Telephone Company's office in North Chelmsford experienced a 50% reduction in its heating costs for one month during its brief (and continuing) period of its operation.

Study Categories

For near-term application, the following broad categories would be covered:

1. Energy conservation in existing and new buildings
2. Energy conservation in transportation
3. Solar climate control
4. Recycling and solid waste management for power
5. Waste heat recovery
6. Wind-powered generating systems

The status of nuclear energy for future systems would be reviewed in terms of the current controversy regarding hazards, costs to provide adequate safeguards, effect on the timetable for implementation.

The potentials that exist over the longer term in off-shore oil, regional hydropower and ocean waves and thermal gradients.

In each category, the following aspects would be examined:

1. Effect on costs, both capital and operating. Relative savings compared with conventional systems. Degrees of risk.

2. The impact on employment in research, manufacturing, distribution, installation, and service industries.
3. Implementation: A timetable would be developed which would recommend installations for schools, hospitals and other state facilities.
4. Social and environmental aspects. Effect on health, where applicable, and conflicts, if any, with building or zoning codes will be assessed.

In terms of use by industry and commerce, the following categories would be considered:

1. Incentives: Legislative programs involving capital assistance, mortgage guarantees, tax benefits would be formulated.
2. Costs: The resultant effect on the cost of doing business would be determined.

Organization of the Program

The philosophy behind the organization of this program is as follows:

1. To identify and propose specific courses of action in the development and application of alternate energy resources.
2. To provide a basis for government policy in terms of implementation of proposed courses of action
3. To provide a basis for legislative action to establish incentives and safeguards.
4. To facilitate industrial and commercial follow-through along the path established by the state's utilization of alternate energy resources.

Figure 1 presents the organization chart illustrating the mode of operation to be adopted in order to translate this philosophy to reality.

The consortium would perform the studies and develop the recommended courses of action to be undertaken (1).

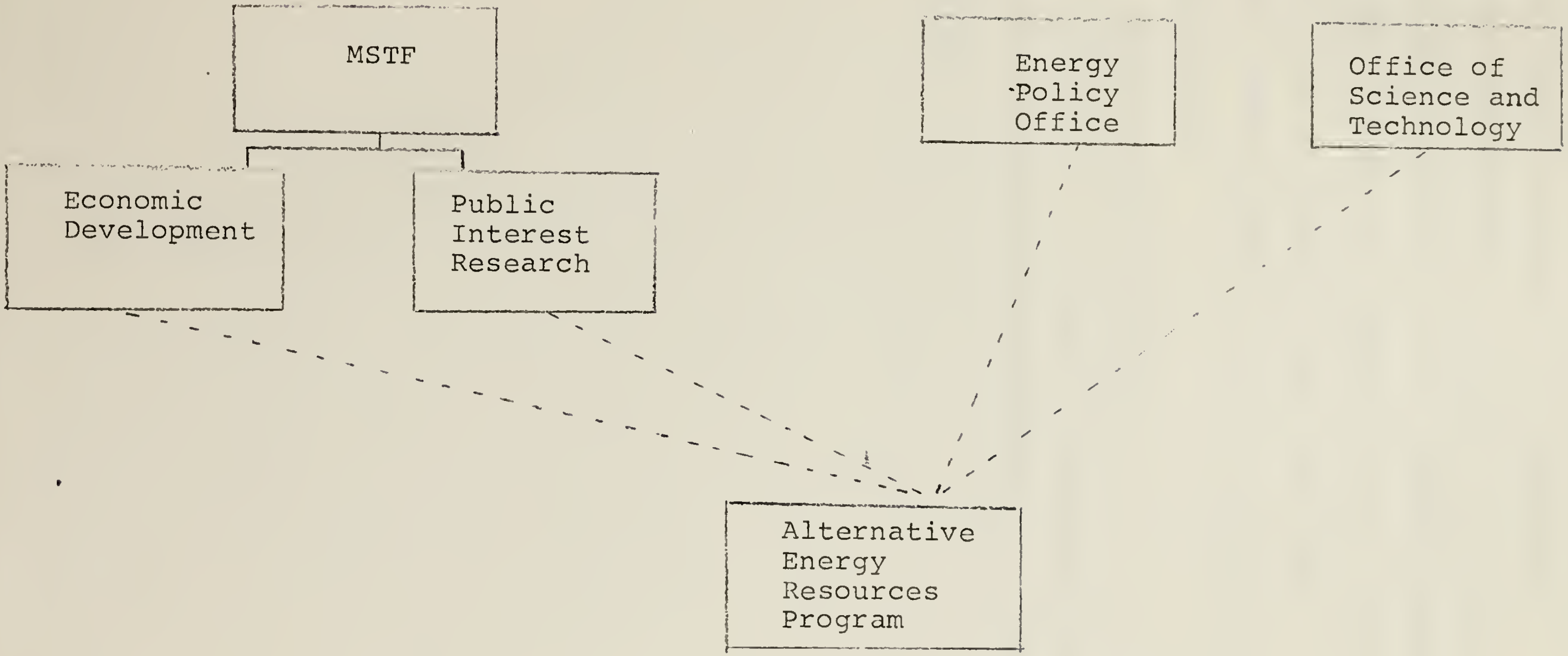
The proposed results would be directed to the Office of Energy Policy for implementation (2).

The basis for legislative action would be coordinated with the Office of Science and Technology (3).

Technology Transfer would be directed through Economic Programs Office at Massachusetts Science and Technology Foundation.(4)

FIGURE 1

Organization Chart: Alternative Energy Resources Program


MSTF
Economic Development
Public Interest Research
Energy Policy Office
Office of Science and Technology
Alternative Energy Resources Program

The role of MSTF is of a two-fold character:

(1) To coordinate the work of the consortium

(2) To serve as a transfer mechanism for industrial and commercial utilization of the adopted technologies.

By using a consortium approach to this program, the following desirable objectives are fulfilled:

(1) The best technological talents available are all able to participate.

(2) Their efforts are coordinated.

(3) A consensus on the course(s) of action to be pursued provides the basis for recommendations to the state government.

Background of the Consortium

Arthur D. Little, Inc. is one of the oldest and largest engineering and management consulting firms in the world, and has undertaken substantive studies in energy economics, conservation, and alternate resource development. Recently ADL completed a study for over 200 corporate clients titled, "Energy and the Construction Industry". In this study, ADL examined the effects of rising energy prices, and the unavailability of fuels on the various participants of the building industry. Currently, ADL is undertaking a number of studies for public utilities, regulatory agencies, and other government bodies, relating to unit consumption, regulatory policy, and projections of consumption and peak loading factors.

Massachusetts Institute of Technology Energy Laboratory- serves as a focal point for energy related research at M.I.T. The objectives of the laboratory are broad and include: (1) identification and work towards short-term and long-range solutions to energy related problems; (2) informing public policy makers on energy related matters and provide comprehensive and objective assessments of current and future energy resources, equipment and systems. Major program areas at the Energy Laboratory include energy economics, management and policy; fossil fuel utilization; electric power; energy productivity;

and advanced energy systems. A team from the Energy Laboratory is currently working on an NSF-sponsored program to partially cool a 56-story building by solar energy.

MITRE Corporation (Bedford Operations): MITRE has recently completed two studies relevant to the proposed program: "A Conventional Energy Demand Projection for New England"; "Residential Energy Consumption and Small-Scale Options of Energy Systems for Space Heating". MITRE has been under contract to the National Science Foundation to formulate, evaluate, and recommend a five-year Solar Energy Research Program to be used to demonstrate the technical feasability, economic, environmental and institutional viability, and utilization Solar Energy Systems, including Solar-thermal, solar-photovoltaic, ocean thermal gradient, wind energy, and organic materials.

University of Massachusetts (Amherst) - has an established reputation as a center for wind and ocean thermal gradients as alternate energy sources. The center has carried out programs involving windmill design and demonstration, and has established a firm basis for estimating costs, risks, limitations and prospects for these alternate forms of energy.

Massachusetts Science and Technology Foundation (MSTF) was chartered in 1969 to encourage and develop the scientific and technological resources of the Commonwealth. It's broad objectives include: (1) Technology Exchange, to stimulate new and existing business enterprise through consultation, screening evaluation, and referral; (2) Technology grants to spur the generation of new products and entrepreneurial talent for Massachusetts; (3) Technology Development Corporation, to build the state's economy through financial stimulation of new product development and new business enterprise; (4) Applied Research Management to provide management of state funding of applied research on problems of critical public interest within the Commonwealth; (5) Symposium and meeting management to facilitate technology exchange and for the development of new information by discussion among authorities. MSTF has recently hosted a conference on Toxic Dinoflagellate Blooms (Red Tide), and has conducted a program for E.P.A. on Auto Emissions.

MSTF has an ongoing relationship with leading companies in the state to license new products for development, including computer software and hardware, transportation, electronics, and bio-medical instrumentation.

Plan of Action

The program is conceived as consisting of four phases, the timetable for which is laid out in Figure 2.

Phase I: Would collect and evaluate all available data on alternate energy resources to catalog and identify in terms of operational feasibility the options available for the near term. A report would be issued three months from go-ahead.

Phase II: The results of the first phase would be applied to existing new construction programs planned by the state. Method of application and estimated costs/savings, and risks would be detailed.

Phase III: At the same time, a review of existing state-run facilities would be carried on to determine prospects and advantages of energy conservation and retrofit.

Phase IV: Evaluates and consolidates legislative prosposals for stimulating industrial and commercial exploitation of alternative energy sources and conservation measures.

Phase V: Would identify programs that would be in the state's interest to support jointly with the Federal government for further development prior to commercialization.

Conclusion

The overall result of the proposed program would contain the following elements:

1. An action program for the state which would reduce the operating costs of certain of its facilities.
2. A spur to the development of new indigenous sources of energy which would reduce both the uncertainty in the availability of fuel and the cost of the fuel.
3. The development of a new energy industry within the state.
4. Mass production of new energy systems and plants to lower prices.
5. Legislation to provide incentives and safeguards.
6. Stimulation of industry and creation of jobs.